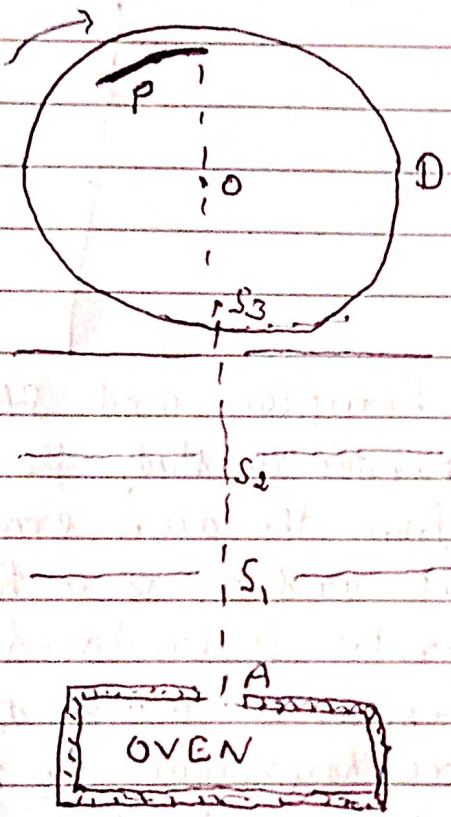
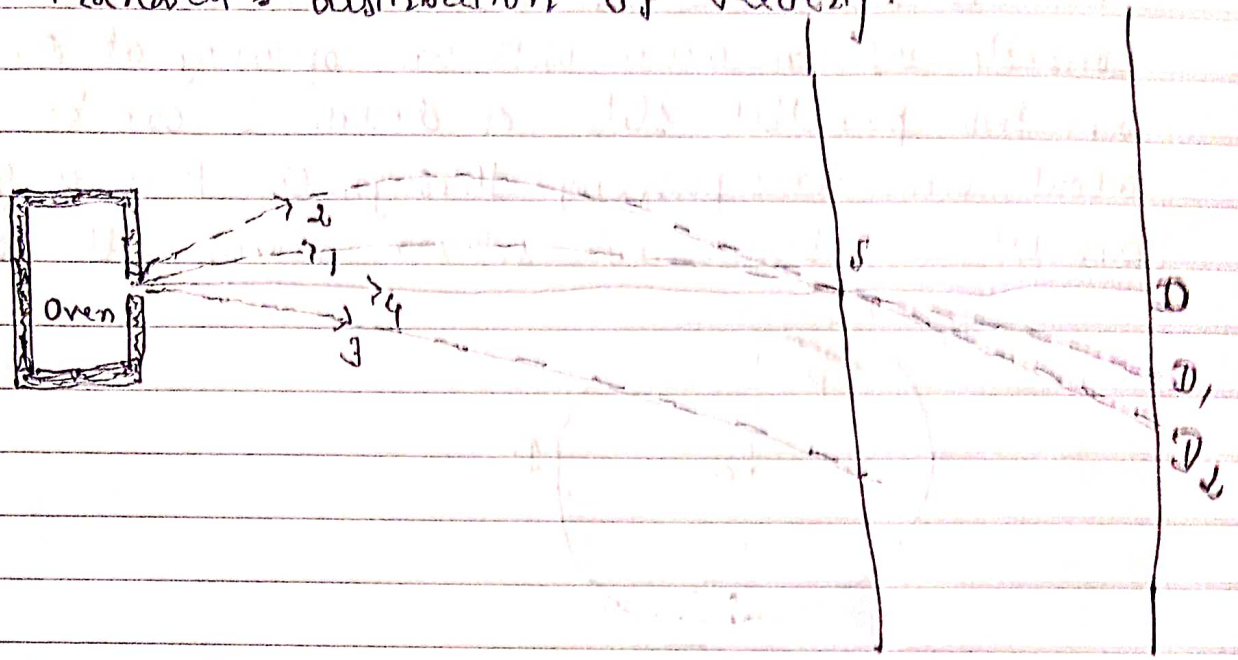
* Experimental Verification of Maxwell's law of distribution of velocities :—

Zartman and Iso (1934) performed an experiment to study the distribution of velocities. The apparatus consists of an oven with an opening at A. S_1 and S_2 are two parallel slits. A drum D can be rotated about an axis passing through O. P is a glass surface on which a beam of silver atoms will get deposited.



Metallic silver is melted in the oven. A beam of silver atoms is ejected through A. A Drum D is rotated with the speed of 6000 r.p.m. approximately. When the drum is stationary, the silver atoms get deposited at the same point on the glass plate. When the drum is rotated a fine beam of silver molecules enters through the slit S_3. Molecules with very high speeds reach the plate P first, i.e. on the right end of P and molecules with very low speeds reach the other end of the plate. After a short time, sufficient quantity of silver is deposited on plate P. Using a photometer (spectro), the relative

Intensity of silver on the plate P is studied and this represents the velocity distribution of the molecules. This graph representing the no. of molecules and velocity agrees with Maxwell's distribution of velocity.



In 1947, Estermann, Simpson and Stern designed a more precise apparatus to study the velocity distribution.

Cesium atoms from the oven emerge from the opening A. S is a slit and D is a hot tungsten wire. The whole apparatus is enclosed in an evacuated chamber (Pressure 10^{-8} mm of Hg). The opening A and the slits S are horizontal. In the absence of a gravitational field, Cesium atoms will strike the wire at D. But due to the gravitational field, the path parabola. The atoms going along the path 3 don't reach the wire. The atoms going along the paths 1 and 2 reach at D_1 and D_2 respectively. The velocity of atoms in path 1 is higher than the path 2.

When cesium atoms strike the wire they get ionized and reevaporate. They are collected by a negatively charged detecting cylinder surrounding the tungsten wire. The magnitude of

the current indicates the intensity of the atoms at various positions. The detector can moved to different positions of the wire. The atoms reaching at D_1 have higher velocity than those reaching at D_2. The vertical height of detector represents the magnitude of the velocity and the ionization current indicates the no. of atoms striking the wire at a particular points. A graph is drawn between the ionization current along the y-axis and the vertical height of the detector along the x-axis. The velocity distribution is found to be in agreement with the maxwellian distribution law of velocity.